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# **Scope of Work Proposed Tasks for 2008 Oklahoma Poultry Project**

## **Introduction**

The following sections provide the proposed Scope of Work associated with the Oklahoma Poultry Project being conducted in the Illinois River Watershed for the year 2008. Proposed tasks are described in this document and cover tasks associated with CDM. In addition, spreadsheets summarizing costs associated with each task have been prepared. Costs are provided for CDM only.

## **Task 6.1 Develop Illinois River Watershed Water Quality Monitoring Plan [on hold pending preliminary injunction]**

**Purpose.** The purpose of this task is to develop a water quality monitoring plan that can determine whether Oklahoma water quality standards are being met in the Illinois River watershed (IRW) after a moratorium has been implemented on land application of poultry litter. Water quality monitoring is the effort to obtain quantitative information on the physical, chemical, microbiological (bacteria) and biological characteristics of water via statistical sampling. In this case, the monitoring effort should be able to identify when water quality standards are consistently being met over a three year period. The monitoring plan will identify a network of monitoring sites located on selected tributaries in the watershed and in Lake Tenkiller. The frequency of sampling and parameters to be measured will also be provided. The location of the monitoring networks and frequency of monitoring will be based upon water quality models being developed by Dr. Bernie Engels and Dr. Scott Wells to determine loading of nutrients into the watershed and in those areas where injuries to surface water are occurring.

**Background.** The decline in water quality of the Illinois River, Baron Fork, Caney Creek and Lake Tenkiller within the last 40 years has, in large part, been attributed to excessive nutrients and pathogens entering the waterways. Algae blooms appear in streams and lakes, and high bacteria levels are common in these waterways. These changes correspond to a significant increase in the poultry industry in northeastern Oklahoma and northwestern Arkansas. These contaminants have negatively impacted the water quality in both Oklahoma and Arkansas, resulting in injuries to various natural resources in both states. Currently the State of Oklahoma is requesting a moratorium be implemented on any future application of poultry waste within the watershed. Once in place, it will be necessary to determine the effectiveness of this moratorium. This can be done by establishing a monitoring network within the IRW. In designing the network the following will be considered:

- Sampling station location
- Sampling frequency

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- Parameters to be monitored
- Oklahoma State Water Quality Standards
- Model predictions and requirements

The data collected under the water quality monitoring plan can be used by the State to determine whether State objectives and standards are being met and when land application of poultry waste can be resumed.

### **Subtask 1- Meetings**

CDM will meet with State personnel to discuss interpretation and implementation of water quality standards. The meetings will include the State's experts and modelers. The focus of the meetings follow:

- How to implement sampling and analysis in terms of sampling frequency and evaluations (statistical analyses, etc.)
- Current requirements for geometric means sampling
- Identification of correct sampling protocols to facilitate comparisons to state water quality standards
- Determine parameter and frequency needs for model predictions

The ability to compare results to state water quality standards is a significant issue. Certain water quality standards are based upon multiple collections within a given time frame, such as fecal coliform which requires a geometric mean of not less than five samples collected over a 30 day period. Identifying sampling protocols which will reduce the need for geometric sampling and still provide an ability to compare the results to State and Federal water quality standards is a high priority goal.

### **Subtask 2- Design of Water Quality Monitoring Network**

There are approximately 200 locations within the Illinois River watershed that have been monitored over the past thirty years. The purpose of this task is to identify those sampling locations that will be useful in determining whether Oklahoma water quality standards are being met and if the moratorium on the application of poultry waste has been successful. CDM will work closely Drs. Engels and Wells, who are developing a land use model to determine loadings of nutrients to the waterways and a CW-QUAL-W2 model to evaluate and predict eutrophication processes such as temperature-nutrient-algae-dissolved oxygen-organic matter and sediment relationships. Requirements in these models will influence the selection of sampling locations, parameters and frequency for the collection of representative water quality data to be used in the models.

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Monitoring stations in Lake Tenkiller and major tributaries into the reservoir (Illinois River, Baron Fork and Caney Creek) will be monitored to determine recovery status after the moratorium has been in place,

### **Subtask 3- Selection of Analytical Parameters**

Water quality parameters to be measured will be governed by the Oklahoma water quality standards, the needs of the models, and those metrics used to determine injuries in Oklahoma's surface waters. Tentative parameters of concern should include (but are not limited):

- nitrogen series
- total phosphorus and soluble reactive phosphorus
- bacteria (Fecal coliform, enterococcus, e. coli)
- dissolved oxygen
- pH
- turbidity
- chlorophyll *a*
- secchi depth in Lake Tenkiller
- algal communities in Lake Tenkiller

As noted in Subtask 2, for those parameters that require multiple collections in a given time period ( e.g. fecal coliform), CDM will meet with the appropriate state agency to determine the correct sampling protocols so comparisons can be made to state water quality standards.

### **Subtask 4- Development of Water Quality Monitoring Plan**

Upon the completion of the previous subtasks, CDM will prepare a water quality monitoring plan to measure and document water quality in the Illinois River watershed after the implementation of the proposed moratorium on land disposal of poultry waste. The plan will identify:

- sampling locations
- frequency of sampling
- sampling schedule
- sampling protocols

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- analytical parameters to be measured and associated protocols
- laboratories to be used
- quality assurance project plan
- methods for data validation and reduction
- a software program for data management, and
- an annual monitoring budget

CDM will prepare a Draft Water Quality Monitoring sampling plan and submit to the State and appropriate parties for review. Upon receipt of comments/suggestions, CDM will prepare the final plan for implementation.

### **Task 6.2 Evaluation of Proper Poultry Waste Management and Appropriate Alternative Remediation Options**

**Purpose.** This is a continuation of Task 5.4 of the 2007 Scope of Work. This task addresses two related evaluations: Task 1 - evaluation of proper poultry waste management and disposal options that can be employed by Defendants upon implementation of a moratorium on land applications of poultry waste in the Illinois River/Tenkiller Ferry Lake watershed (IRW) and Task 2 - evaluation of appropriate remediation alternatives that will address the risk of further and future injury to human health and the environment in the IRW.

The objectives of these evaluations follow:

Task 1 - to identify and evaluate viable waste management and disposal options that can be employed upon implementation of a moratorium on land application of poultry waste within the IRW;

Task 2 - to identify and evaluate viable remediation alternatives that can be employed to mitigate or correct the injuries resulting from the Poultry Defendants land disposal of poultry waste within the IRW.

**Background.** This study will address two key aspects of the relief the State of Oklahoma will seek in its litigation against the Poultry Defendants. The first key aspect is the need, based on the investigations made to date, for a moratorium on land application of poultry waste within the IRW.

The second key aspect is to identify remediation alternatives that will reduce the risk of further and future injury to human health and the environment as identified by the injury analysis prepared by the State's experts and consultants. The State's experts have preliminarily identified several injuries that are related to land disposal of poultry

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waste. These injuries are categorized as (1) Human Health impacts; (2) Tenkiller Ferry Lake (Tenkiller) impacts; and (3) Rivers and Streams impacts. The preliminary injuries to be addressed by remediation are:

### **Human Health**

- 1) Bacterial pathogens and indicator bacteria in the IRW rivers and streams
- 2) Bacterial pathogens and indicator bacteria in the IRW groundwater
- 3) Cyanobacteria (bluegreen algae) in IRW surface waters
- 4) Trihalomethanes and haloacetic acids (THMs/HAA5s) in drinking water
- 5) Taste and odor of drinking water

### **Tenkiller Reservoir**

- 1) Chlorophyll *a* and bluegreen algae dominance
- 2) Transparency/water clarity
- 3) Taste and odor (public water supplies)
- 4) Toxicity of bluegreen algae
- 5) THMs/HAA5s (public water supplies)
- 6) Habitat loss

### **Rivers and Streams**

- 1) Biodiversity
- 2) Water clarity
- 3) Bluegreen algae
- 4) THMs/HAA5s
- 5) Benthic Algae

**Scope of Work.** The scope of this evaluation will consist of the following subtasks:

Subtask 1 - Identification and evaluation of proper IRW poultry waste management options

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Subtask 2 - Identification and evaluation of appropriate alternative remediation options

Subtask 2a - Consultation with State injury experts

Subtask 2b - Refine screening criteria for disposal options and remediation technologies

Subtask 2c - Development of preliminary remedial goals (PRGs)

Subtask 2d - Screening of technologies

Subtask 2e - Alternative development

Subtask 2f - Detailed alternative evaluation

Subtask 2g - Presentation and report

Tasks 1 and 2 are related in that Task 2 will incorporate the evaluations of Task 1 (Waste Management). The evaluations performed in Task 1 will not be repeated but the results of Task 1 will be incorporated into Task 2 as appropriate to address basin wide alternatives concerning injuries in the IRW.

### **Subtask 1 - Identification of proper IRW poultry waste management options**

This task is currently ninety percent complete. The State wants to present to the Court the most cost-effective, environmentally prudent means of waste management and disposal that can be employed by the Defendants upon Court implementation of a moratorium on land application of poultry waste in the IRW. The selection of a "proper" waste management method should consider (1) the effectiveness of the proposed method to protect human health and the environment; (2) implementability of the proposed method; and (3) cost.

Poultry waste management options will be developed from the following sources:

Published studies that address alternative disposal methods

Deposition testimony from the Defendants concerning their evaluation of alternative disposal methods

Discussions with State experts including B. Fisher, G. Johnson, and R. Taylor

Discussions Oklahoma Conservation Commission representatives Dan Butler and Shannon Phillips

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Disposal options will include land disposal outside the IRW as well as other methods that may be cost-effective and implementable. Disposal management options outside the IRW will include consideration of land disposal of poultry waste in the four state regions of Oklahoma, Arkansas, Kansas, and Missouri on land where the county soil nutrient data suggest an agronomic need for phosphorus. Existing land use outside the IRW will be considered to identify locations that are available for the application of waste following implementation of applicable best management practices (BMPs). CDM will work with B. Fisher and G. Johnson to obtain appropriate information to identify locations outside the IRW. This information will include soil test data, animal inventory, fertilizer data, land use, crop data, transportation data, hydrology data and environmentally sensitive areas.

Other waste management and disposal options that may be evaluated include:

- Waste treatment, recycle and/or reuse

- Waste thermal treatment with energy cogeneration

- Waste landfilling inside and outside the IRW in appropriate facilities to prevent environmental concerns

Waste disposal options will be evaluated against effectiveness, implementability and cost. A summary of effective and implementable IRW poultry waste management options will be prepared and provided for review. After discussions, the costs of the retained options will be determined and provided for review.

The retained poultry waste management options will be used in conjunction with the remediation technologies evaluations (as presented in the subtask 2) as applicable to develop remedial alternatives that are consistent and synergistic with the proper management of IRW poultry waste.

### **Subtask 2 - Evaluation of Appropriate Remediation Options**

In conjunction with the identification of proper poultry waste management options (subtask 1), appropriate basin wide remedial alternatives for IRW will be identified and evaluated that address current and future injuries to human health and the environment. The following subtasks outline the anticipated steps that will be conducted during this evaluation:

#### **Subtask 2a - Consultation with State injury experts**

This subtask is approximately seventy percent complete. In coordination with waste management option inquiries, CDM will consult with each of the State's injury experts that are currently completing their analysis of injuries to the IRW. We will obtain updated information from each expert that includes:

- Current list of identified injuries



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Relevant pathways and receptors of injuries

Threshold levels of various constituents to prevent injuries (also see subtask 2c)

Guidance on remedial technologies that may address the injuries

Guidance on effectiveness, implementability and cost of remedial technologies

Persistence of injuries with:

no change to current practices

land application moratorium

implementation of remedial technologies

In addition to consultation with the experts discussed above, CDM will consult with representatives of the Oklahoma Conservation Commission (Dan Butler and Shannon Philips) to determine their preferences based on their experience and knowledge of effectiveness and implementability. CDM will also work closely with G. Johnson and B. Fisher concerning the effectiveness and implementability of selected remedial technologies including alum application to fields with applied waste and appropriate locations of buffer strips.

### **Subtask 2b – Refine screening criteria for disposal options and remediation technologies**

This subtask is approximately ninety percent complete. After consultation with the State injury experts, we will review the gathered information to ensure that we have a complete set of screening criteria that can be used to reliably narrow and rank the alternatives developed to address the injuries. The primary criteria will be:

- (1) effectiveness;
- (2) implementability; and
- (3) cost.

Consideration for synergies with other aspects of the area's economy will also be used to develop metrics to evaluate the remediation technologies and alternatives. For example, if supply chain transportation can be repurposed for hauling of waste to areas outside the IRW that would benefit from agronomic land application of poultry waste, we will develop a protocol to credit that technology in terms of the main criteria (effectiveness, implementability, and cost) or develop additional criteria to capture those opportunities.



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**Subtask 2c - Development of preliminary remediation goals (PRGs)**

This subtask is approximately fifty percent complete. As part of the consultation with the State injury experts, we will seek to define specific metrics that will provide measurable indices of the degree of injury for each media and receptor of concern in the IRW. For each applicable metric, we will establish preliminary endpoints that will indicate the restoration of the resource to an acceptable condition relative to the Defendants' injuries to the IRW. These endpoints or preliminary remedial goals (PRGs) will be developed for human health and environmental concerns. Example PRGs could include:

Reduce phosphorus concentrations in rivers and streams to a specific concentration

Reduce phosphorus concentrations in Tenkiller to a specific concentration

Reduce bacteria in surface waters to a specific concentration

Maintain dissolved oxygen in Tenkiller above a specific concentration

Meet specific State water quality standards

We will work with the State technical experts and the legal team to define specific PRGs related to the injury evaluations as well as existing State and federal water quality standards and regulations that are relevant to the IRW.

**Subtask 2d - Screening of technologies**

This subtask is approximately fifty percent complete. After the complete list of technologies has been assembled and screening criteria finalized, CDM will screen the technologies against the criteria. An initial screening of preliminary remedial alternatives that are inefficient, ineffective, unproven or exceedingly costly were eliminated from consideration. They are:

- Soil removal from land applied fields
- RCRA-type landfills
- Pump and treat ground water
- Catchments/pretreatment ponds for water runoff from land applied fields

The following identified preliminary remedial technologies will be evaluated using the criteria and hazards/injuries discussed above:

- **Soil and land applied fields**

Alum application on fields which have received waste application

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Crop production on land applied fields, harvest, and removal of harvest from the basin

Buffer and/or riparian vegetation strips

### ■ **Groundwater**

Replacement of contaminated drinking water wells

### ■ **Water Supplies**

Treatment of THMs/HAA5s at rural water treatment and distribution plants

### ■ **River/Sediments**

Dredge contaminated sediments from Lake Francis and create a catchment basin for contaminated sediments

### ■ **Tenkiller**

Dredge contaminated sediments in Tenkiller

Cap contaminated sediments in Tenkiller

Alum treatment of Tenkiller water

Aeration of Tenkiller surface water

The above list of technologies is preliminary. Additional technologies may be identified during subtask 2a, consultation with experts and State personnel. We currently anticipate that the effectiveness of some of these technologies will be evaluated using the watershed model developed by B. Engel and/or the reservoir model developed by S. Wells. Based on these modeling results, various technologies may be eliminated or modified. The list of retained technologies will be presented and reviewed by the various experts.

### **Subtask 2e - Alternative Development**

This task is currently approximately twenty percent complete. Technologies and options retained after the screening process will be combined into basin wide alternatives. Each alternative may have one or more options if deemed prudent to develop more robust recommendations. Each alternative will be described and a conceptual basis of design developed that will state all the assumptions used. Assumptions that are common to all alternatives versus those that are alternative specific will be documented. A brief alternatives array table will be prepared that summarizes the major elements of each alternative relative to media and injuries addressed, technology and assumptions.

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The list of alternatives will be reviewed with the various experts for their input and comments. Both B. Engel and S. Wells will also review the alternatives relative to modeling efforts (conceptualization and evaluation of the alternatives in the watershed and reservoir models).

**Subtask 2f - Detailed Alternative Evaluation**

This task is approximately ten percent complete. Each of the developed alternatives and options (if applicable) will be taken through the detailed alternative evaluation using the effectiveness, implementability and cost criteria. Effectiveness will be evaluated using the watershed and reservoir models. Costs will be developed on a conceptual level with capital and operations and maintenance costs presented on a present worth basis. The evaluation will discuss each alternative and its major components and assumptions. Each criterion will be discussed relative to the alternative. The basis for each criterion rating or estimated value for quantitative criteria will be discussed and presented. A summary table with each alternative and criteria will be presented for review and comment.

**Subtask 2g - Presentation and Report**

This task is approximately ten percent complete. Upon completion of the detailed alternative evaluation and adjustment of any criteria weighting, a summary will be provided of the evaluations and conclusions concerning alternatives that meet the PRGs and overall goals at the site. If significant uncertainties remain and preclude detailed conclusions, phasing, more evaluations or modeling to reduce the uncertainty and make a final selection of remedy will be proposed and discussions. Comments will be incorporated into a draft technical report.

**Task 6.3 Beef Cattle and Wastewater Effluent Sampling**

**Purpose.** The purpose of this task is to characterize constituents in cattle waste and wastewater discharges that may impact surface waters in the watershed. CDM will also attempt to characterize the potential constituents that may be leached from cattle waste during rainfall events.

**Background.** Work was conducted in 2007 to collect surface water downgradient from wastewater effluent discharges for phosphorous analyses. Additional samples will be collected from wastewater effluent and cattle waste for further characterization.

**Subtask 1 - Identification of Sampling Locations**

CDM will work with State, City, and other watershed personnel to review facilities to be sampled; identify any required or requested biohazard protocols; and potentially, share information resulting from the field investigations.

**Subtask 2 - Planning**

Activities conducted under this subtask are related to planning the field program. Planning activities will begin with the review of state records to identify the following:

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- Identify up to five facilities with beef cattle grazing on pastures not receiving chicken litter application
- Identify up to four wastewater treatment plants with significant effluent discharges into watershed streams

Planning activities will also include: scheduling access to the fields and effluent discharge locations; updating applicable Standard Operating Procedures (SOPs); and interviewing cattle operation owners and treatment plant operators (if possible).

**Subtask 3 – Soil Sampling and Analyses**

This subtask involves soil sampling at volunteer sites. The sampling procedure will follow the basic outlines of “SOP 5-1 Litter and Soil Sampling” and “SOP 5-2 Litter and Soil Sample Compositing”. Up to three soil grids will be sampled. Two grids will be established on one cattle pasture with no litter application. A third grid will be established on a second property having a cattle pasture with not litter application. Up to three composite soil samples will be submitted for full list analyses. Up to three composite soil samples will be submitted for partial list analyses. Three soil samples will be submitted for Mechlich Phosphorous. Analytical results will be used for reference purposes.

**Subtask 4 – Beef Cattle Waste Sampling and Analyses**

This subtask involves sampling at volunteer sites. The sampling procedure will follow the basic outlines of “SOP 5-3 Manure Sampling for DNA Analysis” which will be modified to be consistent with the proposed program. In general, up to five different grazing pastures will be identified that are currently occupied by beef cattle. At each field, ten “fresh” (not dried) cow paddies will be collected and composited into one sample from that field. In addition, ten dried cow paddies will be collected and composited into a separate sample from that field. A total of up to five fields and five “fresh” and five “dried” composite samples will be collected. The samples will be submitted to the CDM Denver laboratory where a portion of the composited samples will be processed and submitted for the full list of analytical parameters (same list as the chicken litter samples). The remaining portion of the beef cattle waste material will be subjected to a leachate test using EPA Protocols. In particular modified EPA method 1312 (SPLP, synthetic precipitation leaching procedure) will be used to simulate leaching by rainfall (precipitation). The generated leachate will also be submitted for the full list of analytical parameters (same as the Edge of Field samples). In addition, two existing poultry waste (litter) samples will also be leached using EPA method 1312 and analyzed for the full list of analytical parameters.

**Subtask 5 – Wastewater Effluent Sampling**

This subtask involves sampling wastewater effluent at up to four significant dischargers within the Illinois Watershed. Sampling will consist of collecting grab samples of wastewater effluent directly from the wastewater stream. If permission is obtained from

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the wastewater treatment facility, samples will be collected at the wastewater discharge plant. If permission is not obtained from the wastewater treatment facility, CDM representatives will access the receiving body of water and collect the effluent sample at the point of discharge into the receiving body of water. Samples will be grab samples. Samples will be shipped for the full list of analytical parameters.

**Subtask 6 – Sample Shipment and Handling**

This subtask includes shipment of the beef cattle and wastewater effluent samples to the CDM Denver laboratory, sample preparation, and sample shipment to the appropriate analytical laboratories. All collected samples, with the exception of the bacteria portion of the effluent wastewater samples, will be shipped to the CDM Denver laboratory for processing prior to shipment to the appropriate analytical laboratory. Effluent wastewater samples will be sent directly to the laboratory from the field.

**Subtask 7 – Data Compilation and Presentation Preparation**

This subtask involves compilation of laboratory data. The collected data will be input into a database and summarized in preparation for technical memoranda. Presentation preparation efforts will include tables, maps, graphs, and data reports.

**Task 6.4 USGS Support and Miscellaneous Sampling**

**Purpose.** This task will continue to support analyses of samples collected by the USGS.

**Background.** The USGS is collecting samples during certain high flow events and during regularly scheduled sampling event.

**Subtask 1 – Sampling**

CDM will continue to pay for the bacterial analyses for samples being conducted by the USGS. For this program, we have assumed four base flow samples at the five USGS stations and six high flow samples at each of the five USGS stations. Minimal CDM time will be incurred to coordinate with the USGS and the laboratory.

**Task 6.5 Bacterial Analyses by Molecular Methods**

**Purpose.** The overall purposes of this task is to develop a genetic fingerprint for chicken waste that can be identified and quantified in environmental samples of soil, water, and groundwater collected in the Illinois River Basin.

**Background.** This is continuation of Task 5.8 from the 2007 Scope of Work. A key marker of contamination from chicken litter is the presence of selected bacteria known to originate from the litter. Investigations have shown that these bacteria are present in the litter, the soil where the litter is applied, the nearby streams, but not in pristine (noncontaminated) soils/water or in feces from other sources. A molecular method based on bacterial DNA analysis has been finalized to pursue this objective. The method relies on polymerase chain reaction (PCR) for amplification of DNA from samples to improve detection capabilities.

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**Subtask 1 - Q-PCR of Existing and New Samples**

Over 550 samples collected from the Illinois River Watershed have been collected and sent to Northwind Laboratory. The DNA on each of these samples has been extracted and frozen for Q-PCR analyses. To date, approximately 200 samples have been analyzed. Under this subtask, approximately 70 of the remaining existing samples and new samples will be analyzed by Q-PCR. This will include the following samples:

- Existing duck samples: 5
- Existing geese samples: 5
- Existing swine: 1
- Existing cattle: 1
- Existing septic tank: 1
- Existing dairy: 1
- Existing WWTP: 1
- Existing water samples from reference streams: 4
- Existing water samples from recreational areas: 10
- Other existing water samples from streams: 20
- New litter samples: 5
- New bedding material (each type): 4
- New cattle waste (collected during task 6.3): 10

**Subtask 2 - Reference Laboratory Validation**

An environmental/molecular biology laboratory with appropriate credentials will be used to cross-validate Northwind's results. Previously extracted DNA from the target and nontarget fecal samples and some water and soil samples will be used. The complete methodology and the plasmid for developing the standard curve will be provided to the reference laboratory. The Northwind method is well worked out and very reliable and should not cause the reference laboratory any difficulties beyond the normal lab-to-lab adjustments for PCR methods. Approximately 55 samples will be analyzed at the reference laboratory including the following:

- 31 samples of nontarget fecal materials (existing samples of duck, geese, beef cattle, dairy, swine, WWTP and septic)



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- 5 existing litter samples
- 5 existing edge-of-field samples
- 5 existing surface water samples
- 1 existing groundwater sample
- 3 existing soil samples
- 4 existing water samples from reference streams

### **Subtask 3 - Northwind Reporting**

Northwind will prepare a report presenting the results of the analytical results. The report will include a discussion of the methodology utilized for this effort.

### **Subtask 4 - Technical Report and Data Evaluation**

A technical memorandum will be prepared summarizing the results of the above subtasks.

## **Task 6.6 CDM Expert Opinions and Reports**

**Purpose.** This is a continuation of Task 5.9 of the 2007 Scope of Work. CDM identified experts will provide written opinions on selected topics to counsel. After review and comment, expert reports will be finalized. This task also includes costs associated with the deposition process.

### **Subtask 1 - Expert Reports**

CDM identified experts will work with selected counsel to provide technical reports and opinions. For costing purposes we have assumed three expert reports: causation, remediation/restoration costs, and sampling program procedures. Costs for the remediation report is provided in Task 6.2. Draft reports will be provided to counsel. After review and comments, the reports will be finalized and provided to the defendants.

### **Subtask 2 - Technical Support for Expert Reports**

Each report will require the support of various CDM staff to assist in the evaluations to be included as part of the expert's report. The various CDM staff will work under the direct supervision of the expert. This task also includes time to review Expert Reports prepared by the Opposition.

### **Subtask 3 - Depositions**

We have assumed that three CDM experts will participate in two to three days of preparation and up to two days of depositions. We have assumed that six CDM staff



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will also participate in depositions as fact witnesses. Fact witness deposition efforts are assumed to require up to two days of preparation and one day of deposition. In addition we have assumed up to five days of CDM attendance at the deposition of Opposition experts and/or fact witnesses.

### **Task 6.7 Technical Evaluations, Reports and Support for Non-CDM Experts and Opposition Review**

**Purpose.** This is a continuation of Task 5.10 of the 2007 Scope of Work. The purpose of this task is to compile the collected data, perform evaluations, provide support to the various experts and provide technical reports suitable for use by the technical experts and attorneys. Additionally the data will be summarized for presentations to attorneys, appropriate state agencies, and applicable meetings. This task will include report preparation and presentations. Costs are also included for CDM Review of Opposition Expert Reports and CDM attendance at select Opposition Depositions.

#### **Subtask 1 – Technical Evaluations and Reports**

Various CDM staff will provide technical evaluations for selected experts. This will include the current modeling being conducted under the direction of Dr. Engel, the statistical analyses of data for various experts, the support for Drs. Cooke and Welch, and the support for Dr. Stevenson. As necessary, the evaluations will be compiled into technical reports for use and reference by the experts and attorneys. Reports may also be generated to provide the background for any requests for information or legal actions associated with this project. Technical reports will also be prepared at the request of the client for those activities which will be needed to support litigation.

#### **Subtask 2 – Technical Support**

CDM will provide technical support as requested by the client on an as needed basis. This technical support includes CDM efforts to assist non-CDM experts in the preparation of their reports. Additionally, these efforts include CDM attendance at select Opposition Depositions and review of the Opposition expert reports. Costs associated this task will include some travel expenses.

### **Task 6.8 Meetings**

**Purpose.** This is a continuation of Task 5.11 of the 2007 Scope of Work. The purpose of this task is to attend meetings requested by the attorneys and their firms associated with this project. This includes helping the attorneys with meeting arrangements, attending meetings with attorneys, technical experts and state agencies.

**Background.** This project will require coordination meetings with the attorneys and firms associated with this project.

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### **Subtask 1 - Meetings**

CDM will attend meetings at the request of the client. Costs associated this task will include travel expenses, meeting preparation, meeting time, and post-meeting follow-up. CDM will help the client with setting up meetings, which includes providing meeting arrangement support, assisting with travel arrangements for attendees, participating and providing technical input to the meeting. It is anticipated that there will be one meeting for all the experts and appropriate technical staff in 2008. CDM assumes that this meeting will be held in Tulsa.

### **Task 6.9 Data and Document Production**

**Purpose.** This is a continuation of Task 5.12 of the 2007 Scope of Work. CDM has generated numerous amounts of data during this study and the data are being incorporated into a format that can be used for various evaluations. Additional data will be generated during 2008 and will be entered into appropriate databases. This information will be used by the technical experts in the development and support of their expert reports. This task will include reviews to make sure all experts are using accurate and consistent data. In addition, any remaining and new field notes, analytical data, biological data, bacterial data and QA/QC reports will be produced and provided to the defendants during 2008. Other information including work plans, operating procedures, literature, and other documents will be prepared for production to the defendants. In late 2007, Roger Olsen produced his considered and relied upon materials. This production will be updated to include new and existing materials considered and relied upon for his technical report (task 6.8).

#### **Subtask 1 - Data Evaluation and Production to Experts**

CDM will continue to coordinate with the database manager (Robert van Waasbergen) to identify the appropriate data needs to support the requests of the technical experts. CDM will also compile data into suitable documents to provide to the defendants. This will include field notes, chemical and bacterial data from commercial laboratories and collected biological data from the 2008 field work. Also included will be the reviews associated with data quality assessment. In addition this task will include review of all data bases being used by various experts to make sure that they are accurate and consistent.

#### **Subtask 2 - Document Production**

CDM will continue to assist the attorneys and technical experts in the production of documents to support litigation. This includes document management, copying, and filing of project related documents, including electronic mail. This also includes submittals of "Considered and Relied Upon Material" associated with the expert reports and depositions. CDM will maintain a central document repository for all documents generated by CDM staff.

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**Task 6.10 QA/QC and Opposition Field Book and Video Review**

**Purpose.** This is a continuation of Task 5.13 of the 2007 Scope of Work. The purpose of this task is to ensure that the data collected in all tasks are of a known and acceptable quality. QA procedures such as tracking, reviewing, and auditing will be implemented in accordance with professional standards, regulations and guidelines, and specific project goals and requirements. Specific QA/QC tasks include Laboratory Coordination, Laboratory Quality Reviews, and Field Sampling Reviews. The purpose of the Database Support is to maintain the project database which contains of all analytical results from samples collected in 2005, 2006, 2007, and 2008. Additionally, this task includes costs associated with review of the produced videos, field notes, and photographs produced by the Opposition.

**Subtask 1 – Laboratory Coordination**

This subtask will consist of coordination with the contracted laboratories for bottle and cooler orders, use of the most appropriate test procedures, reporting procedures (both electronic and hard copy), QC reporting levels (level 2 or level 3), and proper invoicing between CDM and the contracted laboratory.

**Subtask 2 – Laboratory Quality Reviews**

This subtask consists of a review of laboratory data produced during the project for the field program. The review will consist of an evaluation of the data based on the PARCC parameters. The PARCC parameters are defined below:

**Precision.** The degree of agreement among repeated measurements of the same characteristic. It may be determined by calculating the standard deviation, or relative percent difference, among samples taken from the same place at the same time.

**Accuracy.** Measures how close your results are to a true or expected value and can be determined by comparing your analysis of a standard or reference sample to its actual value.

**Representativeness.** The extent to which measurements actually represent the true environmental condition or population at the time a sample was collected.

**Completeness.** The comparison between the amounts of valid, or usable, data you originally planned to collect, versus how much you collected.

**Comparability.** The extent to which data can be compared between sample locations or periods of time within a project, or between projects.”

**Subtask 3 – CDM and Opposition Field Sampling Reviews**

This task consists of review of all field sampling activities for consistency with the standard operating protocols and approved methods. Deviations and justification of

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deviations from standard operating protocols will be documented. Data associated with selected sampling events will also be reviewed to document acceptability and representativeness. This effort includes CDM review of Opposition Videos, photographs, and field books.

**Subtask 4 – Evaluation and Technical Memorandum – QA/QC**

The purpose of this subtask is to summarize the evaluations conducted during the above subtasks 2 and 3. The information will be input into a database and summarized in preparation for technical memorandum.

**Subtask 5 – Project Database Loading and Maintenance**

This task includes checking and loading any remaining 2006, 2007, and 2008 data collected and analyzed into the project Microsoft Access database and performing routine maintenance. Currently, most of the data collected in 2005 through 2007 have been loaded into the database and checked to ensure the accuracy of the database compared to lab reports. Analytical data collected in 2008 will be loaded and checked in the same manner. General queries, viewing forms, and data reports will continue to be developed for ease of use and data evaluation tasks. This task will be coordinated with Robert van Waasbergen. All data will be provided to Robert in an appropriate database.

**Task 6.11 2008 Stream and Lake Sampling**

**Purpose.** The experts have recommended additional stream and lake sampling and monitoring as a result of the heavy rains this spring. They would like to determine whether the conditions experienced this spring will have a different impact than the conditions monitored between 2005 and 2007.

**Subtask 1 – Identification of Sampling Locations**

CDM will work with Jan Stevenson to select thirty of the previously sampled 70 biological stations for observations and sampling in 2008. Fifteen high chicken house density streams and fifteen low chicken house density streams will be selected.

**Subtask 2 – Planning**

CDM will coordinate with Lithochimeia and Jan Stevenson to prepare a schedule and make the appropriate arrangements to conduct the stream sampling effort.

**Subtask 3 – Stream Monitoring**

Stream monitoring will consist of algal cover and algal identification during four different events over an eight week period (every other week). Samples will also be collected for analyses of phosphorus (three forms), nitrogen (two forms), total organic carbon, silica and alkalinity. All 30 locations will also be visited during the weeks when sampling is not occurring to observe and visually document conditions.

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### **Subtask 4 - Lake Monitoring**

Lake Tenkiller will be monitored at the four previously established monitoring stations. Monitoring efforts will consist of three events over the next two to three months. At these times, temperature/DO profiles and Secchi depth will be determined and samples will be collected for analyses of phosphorus (three forms) and chlorophyll. In addition, one event will document early morning DO profiles.

### **Subtask 5 - Sampling Shipment and Handling**

This task includes the efforts to prepare and ship the samples and equipment.

### **Subtask 6 - Data Compilation and Presentation Preparation**

This task includes efforts to compile and prepare the data for presentation. Given the timing of this project, the efforts to perform this subtask have not been incorporated into Tasks 6.7, 6.9, and 6.10.